CARLO GAVAZZI SPACE SpA

0 CERN MIT L3 A&C/AMS

AMS02-PDS

NON CONFORMANCE REPORT

1 NCR ref: Doc.N°: NCR-PDS-CGS-C-132 | Rev.: 1 | Date: 18/03/09 | Page 1 of 5 | attach: Annex A, B, C, D

2 NCR Title: PDS input current telemetry

IDENTIFICATION

3 Supplier	4 Purchase Order N°.	5 Model	6 Subsystem	7 Procedure/Work Item N°
CGS	N.A.	PFM	N.A.	N.A.

8 NC ITEM Identification	9 Drawing N°. Rev.	10 P.N. / C.I. N°	11 Serial N°
AMS02 Power Distribution System Assembly	10-AMS02PDS-000.00 /	10-AMS02PDS-000.00 / PDS18	FM01

12 Next Higher Unit Id.	13 Drawing N°. Rev.	14 P.N. / C.I. N°	15 Serial N°.
NA	NA	NA	NA

DESCRIPTION

16 NON CONFORMANCE Detected During:
RECEIVING INSP. ☐ MANUFACT. ☐ ASSEMBLY/INTEGRATION ☐ FINAL INSPECTION ☐ TEST ☒ OTHER..... ☐

17 Initiator, Dept., Date, Signature A.Albertin, Technical directorate, 18/3/09

18 Description of NON CONFORMANCE

During reduced thermal test foreseen by NCR-PDS-CGS-C-129, the following problems have been observed at -25°C unit temperature:

- the input current telemetry reaches the saturation. See columns CAN BUS 30 telemetry [A] and CAN BUS 31 telemetry [A] of tables contained in Annex A.
- The telemetry tolerance exceeds the 5% full scale value See columns CAN BUS 30 Full scale error [%] and CAN BUS 31 Full scale error [%] of tables contained in Annex A.

19 Requirements violated

AMS-RQ-CGS-002 Is.1 Par: 3.2.2.3.1

INTERNAL NRB DISPOSITIONS

20 INTERNAL NRB Dispositions:

See next page

21 Verifications

22 Suspected cause of NC: HANDLING ☐ TRANSPORTATION ☐ TEST EQUIPMENT ☐ TOOLS ☐ SW ☐ DESIGN ☒
OPERATOR/PROCEDURE ERROR ☐ PART ☐ MATERIAL ☐ PROCESS ☐ TEST ☐ OTHER..... ☐

23 Classification: MINOR ☒ MAJOR ☒

Corrective/Preventive Actions: NONE 30/04/09 — 24

25 REQUEST FOR WAIVER: YES ☒ NO ☐ N° PDS-WV-CGS-002 Is. 1

26 Analysis Required: YES ☐ NO ☒ N°

27 Other related documents: NONE

Department:	28 P.A.	29 Syst. Engineering	30 P. M.	30	31 C.C.
Name:	Francini E.	Alia S.	K. OLIVIER		Chiquepain C.
Signature:					
Date:	18/03/09		18.05.09		18/03/09

CUSTOMER/HIGHER LEVEL CONTRACTOR NRB DISPOSITIONS

32 CUSTOMER/HIGHER LEVEL CONTRACTOR NRB Dispositions (Close Major Only):

21 Verifications

33 Finally determined Cause of NC

34 Corrective/Preventive Actions:

35 Customer/HLContractor Approval:

Department:		AMS	ASI-PA	ASI-PM
Name:		M. CAPELL	E. MANCHESTI	E. MUSSO
Signature:		M. Capell	E. Manchesti	E. Musso
Date:		8 May 09	12/MAY/09	12-MAY-09

36 CLOSE OUT CERTIFICATION

CGS PA/QA	PA/QA Stamp
E. FRANCINI	CQ 2 C.G.S.
11/05/09	

37 CONTINUATION SHEET

[ ] SUSPECTED CAUSE OF NC [X] INTERNAL NRB DISPOSITION [ ] DESCRIPTION OF NC
[ ] FINALLY DETECTED CAUSE [ ] CUSTOMER NRB DISPOSITION [ ] CORRECT/PREVENT. ACTIONS
[ ] REQUIREMENTS VIOLATED

21 Verifications

In order to avoid the saturation effect at low temperature (e.g. -25°C), the full scale current value shall be set to 33A.

Follow next steps.

1. On CAN BUS I/F P.N.: 11-AMS02PDS-500.00 S/N: 01 dismount the following resistors and set them adj:

R209: was M55342K06B475ER
R232: was M55342K06B75E0R
R220: was M55342K06B10E0R
R222: was M55342K06B11E0R
R223: was M55342K06B1F00R
R260: was M55342K06B75E0R
R234: was M55342K06B10E0R
R235: was M55342K06B9E53R

1) Closed 20/3/09

2. On CAN BUS I/F P.N.: 11-AMS02PDS-500.00 S/N: 02 dismount the following resistors and set them adj:

R209: was M55342K06B332ER
R232: was M55342K06B75E0R
R220: was M55342K06B4E99R
R222: was M55342K06B75E0R
R223: was M55342K06B1F00R
R260: was M55342K06B66E5R
R234: was M55342K06B10E0R
R235: was M55342K06B11E0R

2) Closed 20/3/09

3. Perform electrical test to select the correct values of the resistors.

The following values have been selected:

SN 01:
R222 = 3,01K
R220 = 332K
R232 = 61,9K
R209 = 274K
R234 = 2,21K
R235 = N.M.
R260 = 75K
R223 = 121K

SN 02:
R220 = 9,53K
R222 = 3,01K
R209 = 200K
R232 = 61,9K
R234 = 3,92K
R235 = 7,5K
R260 = 61,9K
R223 = 205K

Resistors are mounted on Adj wires

3) Closed 25/3/09

To verify the possibility to reduce the tolerance error further investigation is necessary also on the circuit located in the IS board. EQUAL TO PFM P/N: 11-AMS02PDS-200.03 REV.1
For this reason an IS PCB spare is used, and the relevant telemetry circuit is mounted.

5) Closed 21/4/09

4. Mount on the IS PCB spare the circuit as indicated in the Annex B e C, FOR POSITIONS OF COMPONENTS SEE DWG: 11-AMS02PDS-200.00 REV.1
5. verify the component behaviour with temperature variation

4) Closed 27.03.09

NOTE: SOLDER ACCORDING TO ESA ESCC-Q-70-08A AND ESA PSS-01-738 IS. 1.

37 **CONTINUATION SHEET**

☐ SUSPECTED CAUSE OF NC ☒ INTERNAL NRB DISPOSITION ☐ DESCRIPTION OF NC

☐ FINALLY DETECTED CAUSE ☐ CUSTOMER NRB DISPOSITION ☐ CORRECT/PREVENT. ACTIONS

☐ REQUIREMENTS VIOLATED

21 **Verifications**

With respect to the saturation problem of telemetry circuit, as described in the first page, the following components must be mounted:

6) 28/04/09 closed

6. On CAN BUS I/F P.N.: 11-AMS02PDS-500.00 S/N: 01 mount the following resistors

R209: Description: 274KOhm RM0705 0,1W 1% 0705
Part number: M55342K06B274ER
Proc. Spec: MIL-PRF-55342/6

R232: Description: 61.9K RM0705 0.1W 1% 100ppm
Part number: M55342K06B61E9R
Proc. Spec: MIL-PRF-55342/6

R220: Description: 332K RM0705 0.1W 1% 100ppm
Part number: M55342K06B332ER
Proc. Spec: MIL-PRF-55342/6

R222: Description: 3.01K RM0705 0.1W 1% 100ppm
Part number: M55342K06B3E01R
Proc. Spec: MIL-PRF-55342/6

R223: Description: 121K RM0705 0.1W 1% 100ppm
Part number: M55342K06B121ER
Proc. Spec: MIL-PRF-55342/6

R260: Description: 75K RM0705 0.1W 1% 100ppm
Part number: M55342K06B75E0R
Proc. Spec: MIL-PRF-55342/6

R234: Description: 2.21K RM0705 0.1W 1% 100ppm
Part number: M55342K06B2E21R
Proc. Spec: MIL-PRF-55342/6

R235: Description: Not mounted
Part number: N.A.
Proc. Spec: N.A.

7) closed 29/04/09

7. On CAN BUS I/F P.N.: 11-AMS02PDS-500.00 S/N: 02 mount the following resistors

R220: Description: 9.53K RM0705 0.1W 1% 100ppm
Part number: M55342K06B9E53R
Proc. Spec: MIL-PRF-55342/6

R222: Description: 3.01K RM0705 0.1W 1% 100ppm
Part number: M55342K06B3E01R
Proc. Spec: MIL-PRF-55342/6

37 **CONTINUATION SHEET**

☐ SUSPECTED CAUSE OF NC ☒ INTERNAL NRB DISPOSITION ☐ DESCRIPTION OF NC

☐ FINALLY DETECTED CAUSE ☐ CUSTOMER NRB DISPOSITION ☐ CORRECT/PREVENT. ACTIONS

☐ REQUIREMENTS VIOLATED

21 **Verifications**

R209: Description: 200K RM0705 0.1W 1% 100ppm
Part number: M55342K06B200ER
Proc. Spec: MIL-PRF-55342/6

R232: Description: 61.9K RM0705 0.1W 1% 100ppm
Part number: M55342K06B61E9R
Proc. Spec: MIL-PRF-55342/6

R234: Description: 3.92K RM0705 0.1W 1% 100ppm
Part number: M55342K06B3E92R
Proc. Spec: MIL-PRF-55342/6

R235: Description: 7.5K Ohm RM0705 0,1W 1% 0705
Part number: M55342K06B7E50R
Proc. Spec: MIL-PRF-55342/6

R260: Description: 61.9K RM0705 0.1W 1% 100ppm
Part number: M55342K06B61E9R
Proc. Spec: MIL-PRF-55342/6

R223: Description: 205KOhm RM0705 0,1W 1% 0705
Part number: M55342K06B205ER
Proc. Spec: MIL-PRF-55342/6

8. Perform electrical test on the resistors added on steps 6 and 7

8 OK Closed A. 29/4/09

9. Perform visual inspection on the resistors added on steps 6 and 7

9. OK CLOSED 29/04/09

With respect to the telemetry tolerance problem the investigation performed on points 4 and 5 above have shown the following results:

From electrical test under different temperatures conducted on IS PCB spare, the corrective actions needed on both Input Stage flight boards have been identified with positive results.
The corrective actions requires big effort in terms of modifications:

- Both IS A and B, MIP already performed and board finalized, dismounting from the unit
- Both input stage circuit modification with addition of some extra components
- Additional thermal unit verification

CGS estimate delay for the intervention of 20 days with the introduction of risk of damage to the FM hardware.

Since this time may have a major impact on the schedule CGS request to perform an NRB with AMS collaboration and ASI.

37 **CONTINUATION SHEET**

☐ SUSPECTED CAUSE OF NC ☒ INTERNAL NRB DISPOSITION ☐ DESCRIPTION OF NC
☐ FINALLY DETECTED CAUSE ☐ CUSTOMER NRB DISPOSITION ☐ CORRECT/PREVENT. ACTIONS
☐ REQUIREMENTS VIOLATED

21 **Verifications**

NRB results:

- CGS modified the circuit on the CAN BUS board to recover the problem of the saturation (see point 1,2,3,6,7,8,9)
- CGS ask the possibility to rise a waiver to modify the input current monitor accuracy from 5% to 20% without modifying the hardware.

NRB CLOSED
30/4/09

- AMS collaboration states that the accuracy modification will not impact on the system performance and accept the CGS proposed solution (see Annex D)

SEE ANNEX D, E.

- ASI confirm that the solution is acceptable and confirm the go-ahead with the activities (see (Annex E)
- The NCR must be re-classified as MAJOR

10. Issue the relevant waiver with the new current telemetry accuracy.

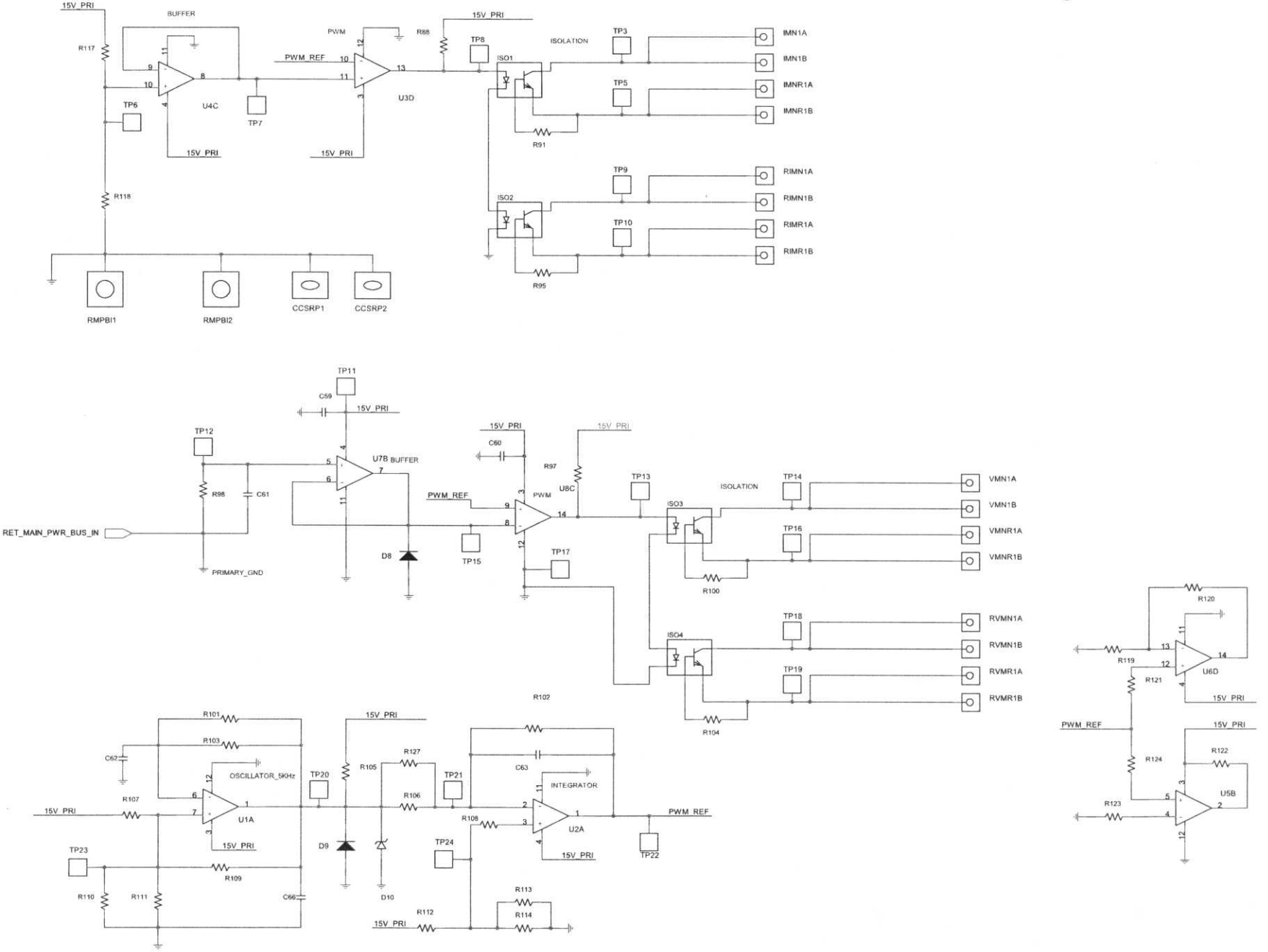
10. CLOSED
06/05/09

I test [A] load set	I [A] Current probe	CAN BUS 30 telemetry [A]	CAN BUS 31 telemetry [A]	CAN BUS 30 Full scale error [%] Max 5%	CAN BUS 31 Full scale error [%] Max 5%
0,5	0,56	1,80	2,15	3,82	4,89
2	1,80	3,20	3,70	4,31	5,85
5	5,35	7,76	8,20	7,42	8,77
10	9,73	12,85	13,10	9,60	10,37
15	15,80	19,20	19,45	10,46	11,23
20	20,30	24,10	24,03	11,69	11,48
25	24,80	26,30 Saturation	26,53 Saturation	4,62	5,32

Tab. 1: Section A TRP=-25°C input current telemetry verification

I test [A] load set	I [A] Current probe	CAN BUS 30 telemetry [A]	CAN BUS 31 telemetry [A]	CAN BUS 30 Full scale error [%] Max 5%	CAN BUS 31 Full scale error [%] Max 5%
0,6	0,56	1,67	1,65	3,42	3,35
2	1,76	2,99	3,08	3,78	4,06
5	4,96	6,85	6,90	5,82	5,97
10	9,76	12,20	12,20	7,51	7,51
15	14,50	17,00	17,20	7,69	8,31
20	20,2	22,65	22,85	7,54	8,15
25	25,9	26,4 Saturation	26,55 Saturation	1,54	2,00
0,6	0,56	1,40	1,40	2,58	2,58

Tab. 2: Section B TRP=-25°C input current telemetry verification


15V_PRI
BUFFER
R117
U4C
TP6
TP7
PWM
PWM_REF
U3D
R88
TP8
ISOLATION
TP3
TP5
ISO1
ISO2
IMN1A
IMN1B
IMNR1A
IMNR1B
R91
TP9
TP10
RIMN1A
RIMN1B
RIMR1A
RIMR1B
R95
R118
RMPBI1
RMPBI2
CCSRP1
CCSRP2
TP11
C59
TP12
U7B BUFFER
R98
C61
RET_MAIN_PWR_BUS_IN
PRIMARY_GND
C60
R97
U8C
TP13
TP14
TP15
TP16
TP17
D8
VMN1A
VMN1B
VMNR1A
VMNR1B
R100
TP18
TP19
ISO4
RVMN1A
RVMN1B
RVMR1A
RVMR1B
R102
R104
R101
R103
C62
OSCILLATOR_5KHz
U1A
R107
TP20
TP21
R105
R106
R127
C63
INTEGRATOR
U2A
R108
TP22
TP23
TP24
D9
D10
R109
R110
R111
C66
R112
R113
R114
R120
R119
U6D
R121
R124
R122
R123
U5B

ANNEX C to NCR-PDS-CGS-C-132

PARTS LIST

COMPONENT	DESCRIPTION	PART NUMBER	SUPPLIER	DATA/CODE	S/N
C59	N.M	N.A.			
C60	N.M	N.A.			
C61	N.M	N.A.			
C62	10nF	CDR32BX103BKSR	KEMET	07-11	
C63	470pF	CDR01BX471BKSR	KEMET	07-08	
C66	N.M.	N.A.	N.A	N.A	
D8	N.M.	N.A.			
D9	N.M.	N.A.			
D10	1N4467US	MV1N4467US	MICROSEMI	07-32	
ISO1	4N48U	JANTXV4N48U	MICROPAC	04-14	
ISO2	4N48U	JANTXV4N48U	MICROPAC	04-14	
ISO3	4N48U	JANTXV4N48U	MICROPAC	04-14	
ISO4	4N48U	JANTXV4N48U	MICROPAC	04-14	
R88	4.99k	M55342K06B4E99R	VISHAY	07-23	
R97	4.99k	M55342K06B4E99R	VISHAY	07-23	
R105	4.99K	M55342K06B4E99R	VISHAY	07-23	
.91	115K	M55342K06B115ER	VISHAY	06-24	
R95	115K	M55342K06B115ER	VISHAY	06-24	
R100	115K	M55342K06B115ER	VISHAY	06-24	
R122	115K	M55342K06B115ER	VISHAY	06-24	
R104	115K	M55342K06B115ER	VISHAY	06-24	
R98	8.25K	M55342K06B8E25R	VISHAY	06-14	
R101	N.M. 0705	N.A.			
R102	470pF	CDR01BX471BKSR	KEMET	07-08	
R117	N.M.	N.A.			
R119	N.M.	N.A.			
R127	165K	M55342K06B165ER	VISHAY	06-52	
R112	10k	M55342K06B10E0R	VISHAY	07-32	
R103	11K	M55342K06B11E0R	VISHAY	06-20	
R107	10k	M55342K06B10E0R	VISHAY	07-32	
R108	10k	M55342K06B10E0R	VISHAY	07-32	
R109	10k	M55342K06B10E0R	VISHAY	07-32	
R106	27.4K	M55342K06B27E4R	VISHAY	07-35	
.110	21K	N.A.	N.A	N.A	
R111	6,49K	M55342K06B6E49R	VISHAY	0708	
R113	6,49K	M55342K06B6E49R	VISHAY	0708	
R114	22,1K	N.A.	N.A	N.A	
R118	10k	M55342K06B10E0R	VISHAY	07-32	
R120	Jumper	N.A.			
R121	Jumper	N.A.			
R123	Jumper	N.A.			
R124	Jumper	N.A.			
U1	LM139	5962-8773901DA	T.I.	05-48	
U2	LM124	M38510/11006BDA	NATIONAL	06-12	
PCB	Input Stage Board Master	11-AMS02PDS-200.03 Rev./	CPV PRINTCA	08-03	A1-2B

NCR-PDS-CGS-C-132

ANNEX D

Sergio Alia

Da: Mike Capell [Michael.Capell@cern.ch]
Inviato: giovedì 30 aprile 2009 13.26
A: Marchetti Ernesto; molivier@cgspace.it
Cc: efrancini@cgspace.it; Sergio Alia
Oggetto: RE: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver
Categorie: CERN SpamKiller Note: -50

Ernesto,

First let me say that the input current is, to my experience, a good, quick indicator of general system health and that this data is not available from the station (which is why I asked for it in the PDS). That said, it is mainly unexpected variations in the current that one looks for more than the absolute value. Plus I doubt that once we get up and running the PDS will be very cold – it is dissipating 300+ watts. In addition we will have this effect well characterized in the PDS TVT (and verify that at the AMS TVT). So, while it is unfortunate that the PDS FM has this problem it won't really have any effect at the system level.

I hope that's clear. The main thing is to get the box here.

-Mike.

Mike Capell +41 22 767 4706

From: Marchetti Ernesto [mailto:ernesto.marchetti@asi.it]
Sent: Wednesday, 29 April 2009 15:32
To: molivier@cgspace.it
Cc: efrancini@cgspace.it; Sergio Alia; Mike Capell
Subject: R: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver

Please let me know about the -25° temperature during thermal test is: Acceptance low temperature; PFM temperature or....?.
Which is the performance impact at system level?

Waiting your kind answer.

Ernesto

Da: Mike Capell [mailto:Michael.Capell@cern.ch]
Inviato: martedì 28 aprile 2009 16.05
A: molivier@cgspace.it; Marchetti Ernesto
Cc: efrancini@cgspace.it; Sergio Alia
Oggetto: RE: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver

OK.

-Mike.

NCR-PDS-CGS-C-132

Mike Capell +41 22 767 4706

From: Massimiliano Olivier [mailto:molivier@cgspace.it]
Sent: Tuesday, 28 April 2009 15:01
To: 'Marchetti Ernesto'; Mike Capell
Cc: efrancini@cgspace.it; 'Sergio Alia'
Subject: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver

Dear Ernesto and Mike,

As already anticipated and discussed informally with Mike the recovery actions needed to solve the saturation issue of the PDS IS current telemetry (traced on the NCR minor attached) have been successfully implemented. Unfortunately the needed actions needed to restore the telemetry down to the required 5% have a mayor impact on the schedule.

AMS preferred solution, given the status of the project, is to accept a waiver to this requirement, and technical contents of the waiver have already been informally evaluated with Mike.

Please review the proposed NCR version annexed (.doc) file and confirm that we can proceed in re-classifying the NCR as Mayor and issue a Waiver for AMS acceptance that will be signed and annexed to the NCR for closure without IS modifications.

Best Regards

Massimiliano

ANNEX E

NCR-PDS-CGS-C-132

Sergio Alia

Da:	Marchetti Ernesto [ernesto.marchetti@asi.it]
Inviato:	giovedì 30 aprile 2009 16.18
A:	Mike Capell; molivier@cgspace.it
Cc:	efrancini@cgspace.it; Sergio Alia
Oggetto:	R: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver
Contr. completamento:	Completare
Stato contrassegno:	Rosso

OK, go ahead
Ernesto

Da: Mike Capell [mailto:Michael.Capell@cern.ch]
Inviato: martedì 28 aprile 2009 16.05
A: molivier@cgspace.it; Marchetti Ernesto
Cc: efrancini@cgspace.it; Sergio Alia
Oggetto: RE: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver

OK.

-Mike.

Mike Capell +41 22 767 4706

From: Massimiliano Olivier [mailto:molivier@cgspace.it]
Sent: Tuesday, 28 April 2009 15:01
To: 'Marchetti Ernesto'; Mike Capell
Cc: efrancini@cgspace.it; 'Sergio Alia'
Subject: PDS : NCR-PDS-CGS-C-132 (m) IS current telemetry tolerance is 20%. NRB for reclassification and Waiver

Dear Ernesto and Mike,

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Best Regards

Massimiliano